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The Manufacture of Shot.

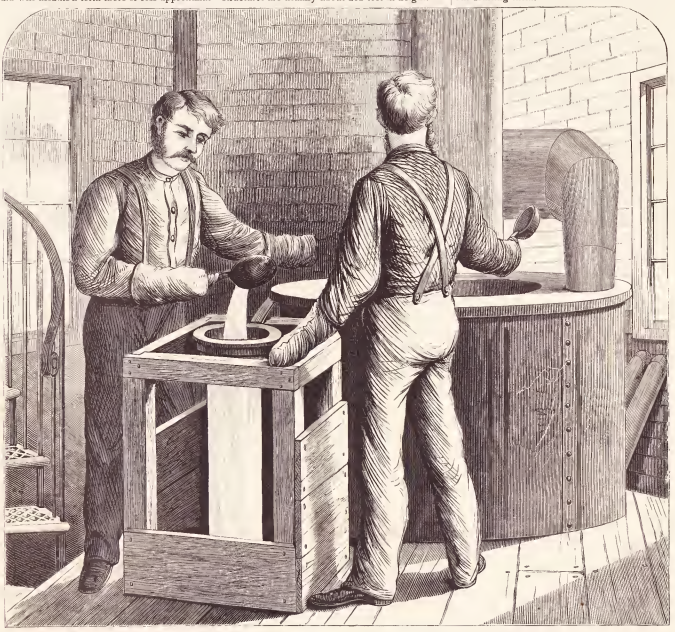
THIS industry, though it involves many scientific principles and a very interesting process, is but very imperfectly understood by most people. It is based upon the fact that liquid bodies tend to assume a spherical form through the force of their inherent cohesive attraction. If this attraction be not interfered with by external forces, any body of liquid will assume a form more or less approximating a sphere. Melted metals are no exception to this rule.

It has been commonly supposed that shot are composed of lead only; but this is a mistake. Experience has shown that pure lead will not, when manipulated as hereinafter described, assume so exact a spherical form as demanded, and therefore an alloy of the metal with arsenic and other ingredients is employed. The addition of these materials is called tempering the lead. Their effect is to give greater effect to the inherent cohesiveness of the molten metal than it would otherwise have, and thus secure the spherical form desired.

Shot are made in what is called a shot-tower. This is a structure in the form of a tower of sufficient height to permit the drops of molten metal formed at the top to become spherical in form and solidify during the time of their descent. Such structures are usually about 212 feet in height.

The furnaces and other apparatus for melting the metal and dividing it into drops, are all at the top of the structure, and the materials are all hoisted thereunto prior to the melting.

At the top of the tower are two small cylindrical rooms, one about twelve feet below the other. Each contains two pots, in which the lead and the tempering materials are melted. From the bottom of the melting pot the melted metal is either run off into a square pan, one side of which is perforated with a greater or less number of holes, larger or smaller according to the size of the shot it is desired to produce. Or another method, hereinafter described, is employed. The streams of liquid metal, upon entering the atmosphere, break up into spherical drops, which cool during their fall to the bottom of the tower, and are received into a body of water, which breaks their fall without bruising them.



THE MANUFACTURE OF SHOT—POURING THE MELTED LEAD.

Another method is to dip the metal from the melting pots and pour it into a vessel with a perforated bottom. This operation is well represented in our first page engraving, which represents the operation as performed in the shot-tower of the Colwell Lead Company in this city, whose office is at 63 Centre Street, and of which Mr. John Hooper is President and Mr. Lewis Colwell is the Treasurer. It is through the courtesy of these gen-

(*Continued on page 260*)

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LOOK AT OUR PREMIUM LIST.—It offers great inducements to active canvassers. Every one has a good chance to get something of value. See premium No. 48 added since last issue.

OUR CASH PRIZES are worth attention. Whoever competes for them and fails will be sure to obtain one of our premiums.

WE WANT, and intend to get, for the coming year a large subscription list. We rely upon our friends everywhere to lend us a push.

THE ILLUSTRATED SCIENTIFIC NEWS, for 1880, will be enlarged to twelve pages of the size of *Harpers' Weekly*. The cost of this increase to us will be 50 per cent. Will not our friends help us to make it up by a large increase to our subscription list?

NEW SUBSCRIBERS who send in their subscriptions will receive the paper from this time till the end of the year 1880.

CAUTION.—Advertisements are appearing in respectable journals, of "syndicates" and other schemes that purport guarantees for investments in stock speculations in Wall Street. Such advertisements have been offered to us and declined, for the reason that they are no more nor less than swindles.

A respectable broker recently told us that he never heard of a case where any one who put money in ever got a cent out. We will not advertise such swindlers if we know it.

SIGNS OF IMPROVEMENT IN THE BRITISH IRON TRADE are apparent. The Board of Wages of the South Staffordshire Iron Trade have awarded an increase of sixpence per ton in the wages of the operatives. The President of the Board, Mr. Joseph Chamberlain, M.P., in making this award, said he thought the improvement was rather speculative, but that the American demand was genuine, and might be considered permanent. The prices now ruling in the American markets must greatly encourage importations, and we have little doubt that our mother country has seen the worst of her present commercial depression so far as her iron interests are concerned. As will be seen by an article from the *British Trade Journal*, published elsewhere, the English cotton industry has a very gloomy outlook.

Mental Microscopy.

SOMEHOW when a man's mind becomes really enlarged, say, like that of Baron Humboldt, and he is able to place in focus more and more of the cosmos of which he forms a part, the things he at the outset of his life regards as the largest get smaller and smaller, till at last that erst immense and overwhelmingly important thing, himself, becomes so insignificant that it is only through a process of mental microscopy he can discern his little identity among the animalcule that float, swim, or wriggle across the field of view.

How big is a man, anyway? Well, he is smaller than an elephant, and an elephant is smaller than a mountain, and a mountain is smaller than the world, and the world is a mustard seed compared with the sun, and the sun itself is a mere mote in the dust-cloud of spheres that stretches out through the universe beyond the reach of thought. Suppose we could make an exact model of the earth eighty feet in diameter. Eighty feet in diameter would be a pretty large ball as balls go on the face of this planet. Assume, for the sake of easy calculation, the diameter of the earth to be exactly 8,000 miles, and let us proceed to build our model to scale. A mountain five miles high should represent on our model $\frac{5}{8000}$ of 80 feet or $\frac{1}{200}$ of an inch. An elephant built in proportion should be $\frac{1}{2500}$ of an inch in height, and an average man $\frac{1}{3500}$ of an inch tall. An army of 26,400 such men standing shoulder to shoulder in single straight rank would require their general to gallop over a space of one inch to pass them all under review. With a smart horse of proportionate size, ridden at a brisk gallop, he could accomplish this distance in about an hour. Viewed in this way a man is a mere mite crawling over the face of the globe, yet he has had the arrogance to think the universe was formed for him more than for other insects, and that the Ruling Intelligence had him pre-eminently in view in bringing order out of chaos.

Mankind has long practiced self-magnifying by endeavoring to discover and hold in view what is weaker, smaller, or otherwise inferior, and he forgets the limitation of his powers in looking down. It is only by looking down that he can put out of sight his own insignificance; but the more he looks up and out away from himself, the more he must of necessity become impressed with his infinitesimal share of the sum total.

So small as man is, and barely able to discern some few of the relations which link him to the general whole, how absurd it is to suppose all things made for his use. Yet to and from these minute centres which we call ourselves flashes the mysterious light of the supreme intelligence.

Expert Testimony at the Hayden Trial.

THIS trial is destined to become celebrated in medical jurisprudence, for the amount and character of the expert testimony introduced by the prosecution. In ordinary murder trials, where poisoning is alleged, a mote or less exhaustive analysis of the stomach and other viscera is sufficient for the purposes of the state; but in this case the microscopic experts have been called in, first, to testify to the character of a blood-stain found upon the pocket-knife of the accused, and, second, to prove that the arsenic alleged to have been purchased by Mr. Hayden at a local druggist's, and placed in his barn by him to avoid danger to other members of his family, is not the arsenic he really did buy at the store in question; the arsenic placed in the barn, according to the theory of the prosecution, having been obtained from another source to account for the purchase at the local druggist's.

The state has taken a great deal of trouble and sustained considerable expense to impress this theory upon the minds of the jury.

Prof. Dana was even sent to Europe to examine specimens of arsenic manufactured at different establishments, and he came into court with upward of a hundred slides, prepared to exhibit under the microscope the great variation in the size and shape of arsenic crystals from different sources. The novel incident of the exhibition of these crystals to the jury by the aid of a stereopticon, to avoid the tedious process of submitting them in the microscope to each juror individually, is, we believe, unprecedented in the history of medical jurisprudence.

There is, however, after all the pains the prosecution has taken to establish this part of its theory, a loop-hole of escape, and if the astute counsel for the defence should fail to discover it, we shall be very much disappointed.

To prove that Mr. Hayden purchased the barn arsenic elsewhere than at the local druggist's, a comparison of the same with some arsenic purchased by a Mr. Colgrove, at the same place and from the same jar, is relied upon. But the weak point in this is that the arsenic purchased by Mr. Colgrove is proved to have been the last in the jar, the bottom of which was cleaned out to supply the amount ordered, which, after all that could be done, was only insufficiently supplied.

Now it is well known that, in establishments of this kind, when a dealer orders an additional supply of any drug, he puts it in the jar upon the top of whatever remnant there may be there, and the probabilities are very strong that the arsenic purchased by Mr. Colgrove, or at least a considerable portion of it, may have remained in the jar for years, and itself have been purchased from a different source from that taken from the same receptacle and sold to Mr. Hayden. If there be the slightest doubt on this point the jury must give Mr. Hayden the benefit of it, and all the elaborate testimony of microscopists, relating to the different characteristics of different samples of arsenic, and the differences between the "Colgrove" and the "Barn" arsenic must go for nothing, so far as its bearing upon the guilt of the accused is concerned.

However, Science will get the benefit of the elaborate researches of Prof. Dana, which demonstrate the existence of far greater physical differences in arsenic obtained from different sources than has hitherto been recognized. These differences relate principally to the crystalline forms of the article, resulting from variations in the process by which it is manufactured.

The Use of Slates in Schools—A Substitute Needed.

The propriety of the use of the slate in public schools has probably never before been questioned. For many years it has been considered one of the most important parts of a pupil's outfit for primary schools. It is not to be denied that its advantages are great. It supplies a cheap substitute for paper and ink, and avoids in the use of the latter many inconveniences, such as the soiling of pupils' hands and clothes, as well as the desks, seats and floors in school-rooms. The easy erasure and correction of errors for which it provides adds to its convenience. But as a school implement it has a drawback, sufficient, in our opinion, to demand its abandonment and the provision of a substitute for it, if such can be found, that, possessing its chief advantages, is free from the objection we propose to point out in this article.

It may not be amiss to state what has drawn our attention to this subject.

The writer has a boy of nine years now attending one of the best public schools in the city of Brooklyn. These schools are very praiseworthy in most respects,

and the general progress made by the lad has been satisfactory. In one most important particular, however, he has retrograded constantly. In all that requires manual dexterity, writing, drawing, etc., his work is quite inferior to what he could do at the age of six years. At the latter age he could write his name gracefully, at the present time he can spell and use words with considerable accuracy, even creditably composing short letters to his friends, but he writes no word, not even his own name, other than disgracefully. The child's health is excellent; he is neither nervous nor impatient, but, trying to do his best, he appears to do about the worst possible in either writing or drawing. His hand is schackled by bad habits acquired in the school he has attended. His movements when struggling with a pen are painful to behold. Now, in the advanced classes he may subsequently enter, under good training and careful supervision, he may, after long effort, wholly or partly recover freedom of hand; but, once acquired, he ought never to have lost it. His case is only one of thousands. How has it come about?

The answer becomes plain upon a review of the methods pursued with him. He has been required to copy words from the black-board up his slate, without any instruction as to position of holding his pencil, ordinarily a stub held in the fingers with a sturdy grip and applied with various gradations of force to plow a furrow through the greasy half-cleaned surface, which is the ordinary condition of a school slate. He has also been required, without elementary instruction in writing (not even so much as to correct the bad position a boy can hardly fail to acquire by the use of slate and pencil) to write out words with a black-lead pencil on paper. Nine-tenths of the time the pencil was a soft, inferior article, with a blunt point worn so close to the wood that the muscular fur exceeded the mental effort in this exercise. After all this mistraining (or perhaps we should write it mistraining) he has arrived at a form in which he has begun to receive some elementary instruction in penmanship; but the bad habits of three years acquired through his slate and pencil exercises will all have to be unlearned, and perhaps after three years more of struggle he may write and draw with the facility he ought already to possess.

After most careful consideration of this subject we are forced to conclude that the constant marking upon an unyielding surface like the slate with an inelastic implement like the slate-pencil is identical to that free, delicate manipulation which must be early acquired, if ever, and which is absolutely essential to success in many professions and callings. If this be the case (and we think all who attentively consider the subject will be convinced of the truth of our statements), there is an immediate and pressing requirement for something which, while it shall possess all or nearly all the qualities which have made school slates so popular, shall yet obviate the objection we have pointed out. The following qualities, if obtainable, would secure immediate attention from all educators; to wit, cheapness, durability, facility in erasure, cleanliness, and the power to make a clear, legible mark of variable thickness with a delicately elastic implement having a permanently fine point. As a fluid or ink and a pen are the most usual appliances for writing, the nearest approach to simulation of their action should constantly be sought and maintained. Anything requiring more effort than is necessary to write with the most freely flowing ink and a soft fine pointed pen upon smooth paper, should be avoided. We believe a large fortune might reward the inventor of such a substitute for the school slate.

The Accident on the Greenwood Lake Railroad.

The first train on the above named road which left Montclair, N. J. for Jersey City on the morning of the 4th inst., which was made up of a locomotive tender and one passenger car, plunged through a draw in the bridge over the Hackensack river. The accident resulted apparently from the neglect of the engineer, as the signals indicating that the draw was open were properly set. The engineer was killed, but by a series of remarkable and unprecedented coincidences, the passengers, eighteen in number, were all saved with but slight injury to any.

The speed of the train was such that it made a leap entirely across the open space of fifty feet. The engine and tender both went to the bottom; but, in striking the water, the passenger car broke loose from the tender. At the same time the resistance of the water against the bottom of the car caused the heavy trucks to break loose from the body of the car, leaving the latter floating upon the surface of the water. Down with the tide floated the car, filling with water till the passengers were obliged to stand on the tops of the seats with their heads to the ventilators to avoid drowning. From this perilous position they were rescued by cutting holes through the roof of the car.

The whole affair reads like the most improbable fiction, but the facts are well authenticated. Had not both the tender and the trucks broken loose from the car, it would have inevitably been hauled under, in which case there is not the slightest doubt every passenger would have been drowned.

The engineer whose carelessness caused the accident was the only one killed, his skull being fractured against a timber in leaping from his locomotive. We are safe in saying that the entire series of circumstances attending this accident is without a parallel in the history of railroading.

Fair of the American Institute.

WE continue our notices of wood-working machinery left incomplete in our last.

A fine collection of wood working machines exhibited by Mr. John A. White, of Concord, N. H., claims attention. In the inclosure we notice, first, a Gordon's improved planer. This machine has the novel feature of a lubricated bed and pressure-bar. The bed is cast hollow for an oil reservoir, connection being made with the same, by means of sections of wool inserted endwise in parallel slots or grooves, and extending into the oil below, while the top ends are finished down to the surface, presenting when planed a surface composed of alternate sections of wood and iron, and evenly lubricated by the oil passing upward through the pores of the wood. The pressure-bar is also lubricated in the same way, though with only one section of wood. Enough oil may be put in the reservoir to last three months. Another advantage this machine has over others, is the compact style of frame, and the impossibility of cramping the bed when placed on an uneven floor; and, unlike all other planers, the bed is supported and kept level by means of a central column and two screws, the screws being turned by a hand wheel in connection with gears.

Another worthy exhibit in this enclosure is an improved bare planer. In this machine the shape of the frame is such that any irregularity in the floor will not cause a twist or spring, thereby cramping the tables or throwing them out of line. The cylinder is made of solid, forged cast-steel, and perfectly balanced. The tables are both movable and quickly adjusted by the use of *one* hand-wheel at each end of the machine, and while being raised or lowered the edge of the table will keep at equal distance from the cutting edge of the cylinder, thereby giving the smallest possible amount of opening from the cutters to the face of the work. A patent adjustible rest or guide is attached to the machine, and by simply turning *one* screw it can be set for any bevel, or, if desired, it can easily be removed from the tables. On the front edge of the back table there is a rabbeting groove, by the use of which, in connection with the rest, rabbeting can be done any depth from $\frac{1}{2}$ to $\frac{1}{4}$ inch, and any width desired.

The Kearsarge sand-papering machine exhibited in this inclosure, is a very great labor saver to patternmakers, piano manufacturers, etc. The machine consists of a vertical revolving face-plate on which sand paper is placed and held firmly by a wooden ring. In front of the face-plate is a horizontal iron table, which can be adjusted to any angle to give the desired bevel. In connection with this, and driven by the same pulley, there is an upright spindle, which passes through another horizontal iron table. The spindle is adjustable and has a lateral motion, up and down. Sandpaper can be used on the spindle up to three inches in diameter, and for inside work is unsurpassed.

A band-saw machine shown in this inclosure is also a good machine. It has a solid base which reduces vibration to a minimum, and the tension of the saw is adjusted by means of a sliding weight. It has self-oiling loose pulley, and all the bearings are provided with oil cups. The saw wheels have wood rims with rubber faces.

An ingenious rosette-cutting attachment for a single spindle shaper, is also here shown. A spring bed upon which the work is placed and a superimposed presser together hold the work. The presser forces the work downward with the spring bed to bring the work into engagement with the cutter.

Another novelty in this inclosure is a shingle planer, used for planing sawed shingles, blind slats, etc. It does not change the form of the piece planed. It has two heads which act serially, first to plane one side and then the other side of the piece. Elastic rubber feed-rolls slide the work over a smooth bed. The cutter instead of the bed is adjustable.

There are several other machines shown by this manufacturer, but we must economize our space in speaking of them. A feature of these machines is the supply of solid steel heads for all of them. The inclosure is well worth a visit from all interested in this class of machinery.

Messrs. Witherby, Rugg & Richardson exhibit their picture frame and mitre-cutting machines. The cutter machine shown, has proved its value over and over, and falls into line among the standard wood working machines made in this country. The machine as exhibited here is provided with an improved rule and stop, which gives sight and rabbet measures without calculation.

A foot sawing machine is also shown by this firm, which they claim to be the only foot-power saw ever made that will cut all styles of mouldings so they will join perfectly without planing. The rule has a special gauge, which gives both sight and rabbet measures correctly without calculation, and eccentric handles for holding moulding while sawing the same, without wh ch, it is asserted, it is impossible to saw perfect joints by foot-power. This machine has many other meritorious features, which we do not mention. It is one of the best exhibits in wood-working machines at the fair this year.

Walker Brothers, of Philadelphia, show some fine wood-working machines. Among these we notice a vertical boring machine, designed for all kinds of straight and angle boring, which is a well-designed and evidently a very efficient machine.

A scroll-sawing machine, shown by this firm, has one of the best devices for putting the saw under tension that has come under our notice. It is simple, durable, and gives an even tension. It is also antifriction, no oil being used on any of its working parts.

Walker's patent paneling machine is also one of this firm's exhibits. This machine is specially designed for raised paneling, which work it does in a very superior manner, as well as turning out a large quantity of work. Panels of any style or thickness are cut with equal facility.

We have noticed such of the machines in this enclosure as specially attracted our attention, but there are others shown equally worthy. All who visit the fair should inspect them.

There are a number of small foot-power scroll-saws exhibited by various firms, but we think none of them equal the Demas lathe and scroll-saw attachment, and the Holly scroll-saw. As these are fully described in our premium list, we refer the reader to those descriptions.

A Great Fraud Exposed—Arrest of the Conductors of the Fraudulent Denver Land Company.

A telegram to the New York *Sun*, dated Nov. 8, says: Sidney A. Grant, of Cincinnati, and A. F. Wilson were arrested to-day for conducting a fraudulent scheme through the mails, under the name of the "Denver Land Company." They were taken before a United States Commissioner and committed. Having waived an examination, and having, as yet given no bonds, they will probably go to jail. The swindle was planned in Cincinnati. Stereotype plates were prepared, which already have been inserted in over 800 first-class newspapers and periodicals in the Northern, Eastern, and Middle States. Grant came to Denver to secure land for the purpose, and bought a thousand acres in Sand Hills, forty miles north of Denver, in another county, which was recorded as North Denver. Although Grant was known here but eight days, a perfect avalanche of letters have come through the mails for S. A. Grant and the Denver Land Company. The fraud was exposed by the local newspapers, and bitterly denounced by the citizens. The Postmaster reported the swindle to the Department, and last night received orders to deliver no registered letters and pay no money-orders to Grant. The arrest was made by Special Agent H. Hall. Special Agent Fussay, who is also here, has asked the Department for an order to withhold ordinary letters from Grant. This advertisement was offered to the SCIENTIFIC NEWS on the eve of going to press with this issue; but, being doubtful of its character, we refused to publish it.

Anthracite Coal in Switzerland.—The

introduction of American anthracite coal into Switzerland has had the effect of directing the attention of the Swiss engineers to their own mines. Americans have taught them that anthracite is excellent fuel, and they have learnt from us how to use it. They urge that it would be possible to mine the large amount of coal used by the country (almost 500,000 tons) hitherto imported, from their own anthracite coal basin. In support of their claims for the domestic coal they give the following analysis of the coal taken from the field which extends from Saint-Maurice to Brigue, in the Valais:

BIENDRON MINE.

Carbon	88.16
Hydrogen	2.15
Oxygen and nitrogen	1.34
Ash	8.35

Experiments with this Valais coal for regenerating steam in the locomotive which was sent to Paris by the Philadelphia and Reading Railroad, have been made with good success.

The Polytechnicians on House-Warming, Furnace-Heating and Steam-Heating—A New Heating Gas—Steam Boiler Explosions—Mr. Roosevelt on Modern Progress and Chimney Architecture.

ARTIFICIAL means of heating was the not unseasonable subject discussed by the Polytechnicians at a recent meeting. The chairman, Mr. Stetson, held that furnace-heating was better adapted to city houses, on account of their height, and steam-heating to country houses on account of their "spread-outness," as he called it. In very cold weather, according to him, furnace-heating is a failure, anyhow. He had found it so in his own house. A friend of his got over the difficulty by having two furnaces when the weather was very cold, and so managed to keep his house warm. Practically we can keep ourselves warm with stoves by making them properly hot, but we cannot do so by furnace-heating.

As to steam-heating, the chief inconvenience attending it is the feeling of dampness it occasions. He was for three years at 16 Murray Street, and warmed the place by steam. The dampness was the great annoyance he felt. After long study he made a hole for the exit of the steam; but the feeling of dampness still remained. Then he got cotton cloths and stuffed them into the aperture around the pipe, but these soon got wet, and tin pans had to be placed underneath to catch the dripping moisture, from which a steaming column arose like that from the summit of Mount Vesuvius. This was not agreeable, but it was the best he could do towards getting rid of the dampness. That damp feeling is not experienced when the warming is effected by direct radiation. Grates and open fires draw the floor, doors and panels, and make everything around shrink. Could any one explain why heating by open fires did not give the desirable dryness of the air?

Dr. Richards believed it was because of the large amount of outside air sucked in to supply the fire.

A gentleman said the true reason was that all wood contains moisture.

Dr. Richards queried whether the moisture from the wood did not go up the chimney. "Not all of it," was the reply.

Dr. Guy said that ventilation was the great thing. If the air was let in equably all round, and not more in one part than another, so that there should be no draughts, there would be found to be just dryness enough and moisture enough. He dilated upon the economy of heating which might be secured by the cheap decomposition of water and the consequent production of one of the best heating substances in the world. A process has been already fully developed, said he, for such cheap decomposition and perfectly capable of being applied economically for heating purposes. First, water is converted into steam and the steam passed through a furnace of red hot coals. The steam is decomposed, and the oxygen seizes on the carbon, forming carbonic acid. With this goes a good deal of hydrogen. The next point is to convert the carbonic acid with its accompanying hydrogen into an inflammable gas. This is done by passing it through another furnace containing carbon, superheated. The result is a perfectly inflammable gas, almost as good as hydrogen. From 50 to 55 per cent. of the pure gas is hydrogen. If the operation was carried on on a large scale, the cost, after the works were up, would not exceed 10 cents per 1,000 cubic feet.

Professor Nash inquired if the carbonic acid would not extinguish the burning coals?

Dr. Guy replied that the provision against that was to have two furnaces, one to be used when the other was growing cool and being heated up again.

A gentleman asked if there would not be danger of an explosion when passing the superheated steam through live coals? If there was any truth in the theory of the explosion of steam boilers, that such explosion was caused by an instantaneous expansion of gas with great force, he thought there would.

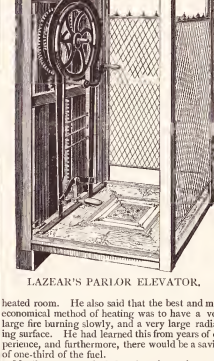
Dr. Guy said the cases of the steam boiler and the heated furnace used in this process were not similar. In the steam boiler the gas was pent up; there was no passage for its exit. It was not so with this furnace, which was provided with an adequate outlet, so that there could be no danger of an explosion.

Mr. Blanchard scouted the theory of steam boiler explosion alluded to. The people who adopt it suppose that some sort of gas is generated that instantly explodes without the least warning. This, according to him, is altogether wrong. Some years ago he bought a dozen old steam boilers and experimented with them. They all burst the same way, and every one who had a theory was disgusted. The bursting in all cases ensued from gradually increasing pressure, and not any sudden expansion of gases.

Dr. Guy said that in the case of the gas obtained by the process he described, 80 units of the heat could be utilized, while only 15 units of that from the ordinary gas could be used.

Dr. Richards knew something about the bursting of boilers, and proceeded to depict the figure of a steam boiler on the blackboard. Some people had said that by getting up sufficient heat the crown sheet could be made red hot. No such thing. He had proved it by elaborate experiment. As it was not possible actually to see the crown sheet or to place a thermometer close enough to it, he devised a contrivance for ascertaining when it should become red hot. He cut a hole in the top and plugged the hole with a piece of metal which was sure to melt at a known heat. He fired up till the heat became enormous, yet that plug did not yield. The inference was that no amount of heat could make the crown sheet red hot.

Mr. Hudson recommended double windows as a protection against dampness in the air of a close,



LAZEAR'S PARLOR ELEVATOR.

heated room. He also said that the best and most economical method of heating was to have a very large fire burning slowly, and a very large radiating surface. He had learned this from years of experience, and furthermore, there would be a saving of one-third of the fuel.

Mr. Stetson remarked that American air was a good deal dryer than the European article. When the air is too dry it becomes painful. He felt it about the temples, but his lungs were not affected.

Dr. Wetherbee, 25 years ago, returned hither from St. Thomas, Porto Rico and other West India islands which he had visited. He arrived here in July, and for the succeeding ten days felt hotter than he ever did down near the tropics.

According to Mr. Roosevelt, all our improvements are backward. The French ladies and gentlemen have so improved on the use of charcoal that they take pans of it into their bedrooms and waken up next morning in the other world. The French people never knew how to make a chimney. The Dutchmen are wrong in making their chimneys taper topwards. They ought to taper bottomwards, and that was a discovery that was to be credited to Benjamin Franklin.

BUCKWHEAT.—The name of this plant, or rather the grain of it, is derived from the German word *Buchweitzen*, "beech-wheat," from the resemblance of the seeds to beech-masts. It is not properly a grain, but belongs to the family of knot weeds, of which there are several varieties in the Northwestern States. It is probably a native of China, but the time of its introduction into Europe is not well ascertained. It has been cultivated in England for about 300 years. It was introduced into North America by the Dutch early in the seventeenth century.

Lazear's Parlor Elevator.

THE accompanying engraving illustrates a parlor elevator invented by Mr. H. Y. Lazear, of No. 8 Gansevoort St., in this city, and on exhibition at the Fair of the American Institute, now holding, where it attracted much attention. The ease with which one or two persons may be raised with no power except what one of them may very easily apply to a winch, seems almost magical, and always draws about this exhibit a crowd of admiring and curious observers.

The engraving represents the cab, a portion of the framework and the entire mechanism by which the cab is raised or lowered.

The general principle of the construction is simple enough. The cab and its load are counterpoised by a weight suspended from a rope which is attached to the top of the cab (a portion of this rope is shown in the engraving), and which passes over a pulley at the top of the building. It will at once be evident that when so counterpoised, all the power necessary to elevate the cab will be that required to overcome friction.

The different weights of persons are compensated for by weights placed on or taken off from the floor of the cab or otherwise attached to the cab. The motion of the cab is effected by a rack and pinion operated by a winch.

Two velocities of ascent are provided for. The winch is shown in the engraving as placed on the shaft of a pinion gearing into a spur wheel on the shaft of the pinion which engages the vertical rack. Thus applied, the ascent of the cab can be made much slower, and consequently with much less muscular effort when the load in the cab has not been adjusted to counterbalance, or nearly so, the counterpoising weight suspended from the pulley rope. The crank, when placed upon the central shaft shown in the engraving, gives a very rapid ascent to the cab, and when the counterpoising is nicely adjusted by weights attached to or placed upon the cab, the effort required from the person in the cab who turns the crank, is very slight. A foot-piece applies a brake by which the descent may be regulated without the use of the crank, and when released from the pressure of the foot a safety device holds the cab from either ascending or descending.

Besides being admirably adapted for use in private households as an elevator, this elevator makes a capital fire escape. For this purpose it may be placed outside of a building of many stories, and communication established from it to each story. We have been much pleased with this invention, and regard it as a very meritorious improvement. In this connection, we would call attention to the advertisement of this elevator, which may be found in another column.

Accidents in Deep Mines.

"ACCIDENTS in the Comstock Mines and their Relation to Deep Mining" forms the subject of a recent paper to the American Institute of Mining Engineers, by Mr. Church, M. E. He points out that heat, the peculiar mode of timbering in square sets, the almost exclusive use of nitro-glycerine powders, the necessity of frequent repairs to shaft timbers, the incessant movement of the rocks through which the shafts are sunk, making accidents in hoisting more than ordinarily frequent, and the necessity of transporting large quantities of rock through narrow gangways entirely by human labor, are the conditions in which mining in the Comstock may be said to suffer rather more than the usual liability to danger. Two of the causes, both connected with the movement of the ground, may be expected to increase with depth. Together with the heat, they comprise 40 per cent of the whole number of accidents. It is concluded that the conditions of deep mining will increase 40 per cent. of the causes which lead to casualties, leaving 60 per cent. unaffected.

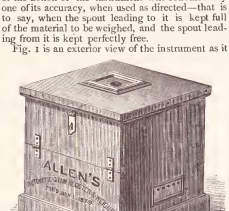
Allen's Automatic Grain-Weigher and Register.

WE take pleasure in illustrating and describing in the present article a very ingenious and useful invention, recently patented, and now manufactured by Dr. Wm. H. Allen, at No. 114 E. 14th St., in this city. This improvement meets fully a want which inventors have hitherto vainly attempted to supply, namely, an instrument by which may be kept an accurate record of the weight of wheat, corn or any other grain or granulated material, such as stamped quartz, shot, etc., running through a spout or tube, and by the indications of which the flow may be adjusted in such manner that the passage of grain to millstones in flouring mills may be accurately graduated to a given uniform quantity in a given time.

Dr. Allen, besides being a skillful dentist and expert mechanician, is the proprietor of a flouring mill in Pennsylvania, where the want of such an appliance was first brought to his notice. Having set himself to the solution of the problem, he has perfected and placed upon the market the first successful device for the purpose, so far as we have any knowledge.

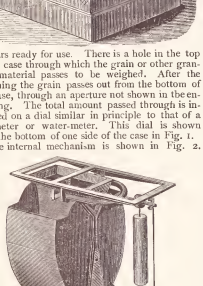
Simplicity is the feature which will at first sight most impress practical minds, and but a brief study of the action of the instrument will convince any one of its accuracy, when used as directed—that is to say, when the spout leading to it is kept full of the material to be weighed, and the spout leading from it is kept perfectly free.

Fig. 1 is an exterior view of the instrument as it



appears ready for use. There is a hole in the top of the case through which the grain or other granular material passes to be weighed. After the weighing the grain passes out from the bottom of the case, through an aperture not shown in the engraving. The total amount passed through is indicated on a dial similar in principle to that of a gas-meter or water-meter. This dial is shown near the bottom of one side of the case in Fig. 1.

The internal mechanism is shown in Fig. 2.



An oscillating receptacle is pivoted to supports downwardly projecting from an oscillating frame, or, more properly speaking, a bifurcated scale beam. This beam has its bearings made of hardened steel, and constructed as in ordinary balances to reduce the friction to a minimum, and it is supported by a rectangular frame.

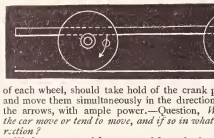
The oscillating receptacle has a vertical central partition, and the grain as it flows into the case is received alternately on each side of this partition. As soon as a given weight has been received, (which weight is regulated by a counterpoising weight suspended from the opposite arm of the beam), the receptacle descends a very little, and, releasing itself from a catch, oscillates into position to receive the stream of grain on the other side of the vertical partition. At the same time a flap at the lower part of the loaded side of the receptacle opens, and the grain discharges from that side before the other is filled. Each side of the receptacle has a flap of this kind, which is held closed by a cross-bar when that side is filling, but which, when the oscillation takes place, opens as shown in Fig. 2.

By means of a ratchet and pawl operated by a small rod that is attached to the end of the bifurcated beam, motion is transmitted to the register, and the amount of grain passed through is accurately recorded.

This improvement has all the elements of success in its perfect adaptation to the end sought to be accomplished. Various sizes are made to suit different requirements. We predict for this invention a speedy, large and increasing demand.

Another Wheel Puzzle.

SUPPOSE, say, a four-wheeled platform car resting with efficient traction, on a level track, each wheel having a projecting crank pin disposed in the position shown. Now suppose four men, one to each wheel, standing on the ground at the side



of each wheel, should take hold of the crank pins and move them simultaneously in the direction of the arrows, with ample power.—Question, *Will the car move or tend to move, and if so in what direction?*

We have supposed four men and four wheels; but this number is in no way essential to the question, as the principle is the same with one.

The Anti-Vaccination League.

The New York *Sun* says:

A tall skeleton in the act of lancing the arm of a plump baby, while a smirking policeman grips the wrist of the mother and thrusts under her eyes a copy of the Vaccination act—such is the startling picture on an envelope bearing a London postmark and addressed to the editor of the *Sun*.

If the outside of this envelope is remarkable, the contents are no less so:

"SIR: A copy of your paper of the 11th inst. brings the welcome intelligence of the formation in New York of an Anti-Vaccination League.

"You will see the tyrannical way in which the vaccination laws are worked here; but, thank God, there are many who will not bow down to the accursed idol of Jenner and the medical priesthood who worship at his polluted shrine. Some go to prison, some pay repeated fines and costs, some constantly change their abode, some neglect to register the births of their children, while not a few emigrate to evade the mandatory law. I am proud to say that I have three unvaccinated children living, and I mean to keep them so.

"WM. YOUNG.

"*8 Neeld Terrace, Harrow Road, London, Oct. 21.*"

That Mr. Young is thoroughly in earnest is shown by the zeal with which he has devoted his time and money for years past to the anti-vaccination propaganda. With Dr. J. J. Garth Wilkinson, he has written and published countless tracts and letters on the subject, which have been scattered broadcast throughout the United Kingdom, besides seeking in all other practicable ways to influence public opinion, and, through that, legislation.

The question raised by Mr. Young and Dr. Garth Wilkinson is a grave one. It comes home to the health of every family. If these Englishmen are right, then the great lights of medical science have been wrong all these years on a vital matter, and Jenner, instead of being a benefactor of the race, inflicted upon it a horrible legacy of disease and woe.

Now that the question is up, the doctors should settle it so that it will stay settled. If these Englishmen are riding a silly and mischievous hobby, they are not riding it alone. A great many persons to not believe in vaccination; a great many more have doubts about it, and they are not all ignorant persons either. Most of them are open to conviction.

Let the doctors make it their business to convince them, if only for the sake of the little ones.

METALLIC SHINGLES.—In our advertising columns will be found the card of the Iron Clad Mfg. Co. The metallic shingles advertised by this house are justly winning a wide popularity. No less than five millions have been manufactured and sold the present season. They make an elegant, durable and water-tight roof, and are a great protection against fire.

HANDREN & RIPLEY'S PRESSURE-REGULATING VALVE.—This is one of the best pressure-regulators in the market. One of our editorial staff, employed as consulting engineer by a company formed for the purpose of introducing steam heating on a large scale in the city of Brooklyn, recently had occasion to examine many devices for this purpose, and recommended the adoption of this pressure-regulator over all others examined by him. See advertisement in another column, the statements in which are thoroughly reliable.

Permeability of Building Materials.

PETTENKOFER has shown that all building materials are permeable to air except metal. Few, however, are aware how easily air can pass through bricks, dry mortar, or even stones. An experiment recently performed by Prof. Doremus, of the Buffalo Medical College, is very instructive on this point.

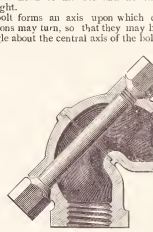
A block of sandstone, such as is usually employed for window caps and sills, and about twelve inches square and four or five inches thick, had a panel of half an inch thick sunk in each side. In each panel was fitted a block, which was perforated by a piece of common gas-pipe, and this was cemented about the edges. The whole was then coated with an impervious varnish. Air now entering the pipe on either side had access to the clean surface of the stone beneath the panel, and it was found that if the mouth be applied to the protruding pipe on one side and a candle be placed in front of the opposite one, it could very readily be blown out by the air, which, with very little effort, was forced through the stone. When a rubber tube was connected with the house gas-pipe on one side of the stone and a burner was attached on the opposite side, the simple pressure from the gas mains was sufficient to force the gas through the stone till it was lit at the burner on the opposite side. When by any means the pressure was increased, a very large flame was thus produced. This shows the permeability of building stone. Brick walls and the plastering of rooms are much more porous, and it is readily seen that unglazed tile or stone or brick sewers afford but little security against the escape of sewer gas.

Chapell's Patent Pipe Coupling.

In the accompanying engraving we illustrate an improved pipe coupling, invented by Mr. E. S. Chapell, and manufactured by the Walworth Mfg. Co., of No. 60 Kilby St., Boston, Mass. It is not only a very ingenious device, but it possesses many important advantages over the ordinary union hitherto used.

As will be seen from the engraving, the coupling is made in two sections, with a steam or gas-tight joint, and the sections are held together by a bolt with a cap-nut passed axially through the plane of the joint and through the walls of the sections that have on their exterior flat surfaces which the head of the bolt and the cap-nut fit steam-tight.

The bolt forms an axis upon which either of the sections may turn, so that they may be set at any angle about the central axis of the bolt. This



is a great convenience in steam or gas-fitting, and the coupling has the further advantage that it can not rust tight and give trouble, like the ordinary unions, when it is desired to uncouple the joined pipes.

It can be used instead of an elbow when an elbow is ordinarily required, thus requiring the fitting of only two pieces of pipe where ordinarily three pieces are required to be fitted.

The tightness of the joint is unquestionable. We are informed that a seven-eighths inch bolt holds perfectly a joint in a five-inch pipe under 110 lbs. steam pressure.

We commend a trial of this coupling by all steam and gas-fitters, and we see no reason why the joint should not be equally applicable to water pipes, and thus prove serviceable to plumbers in all cases where they employ rigid pipes.

A Curious Celebration at Pompeii.

THE commemoration of the eighteenth centenary of the destruction of Pompeii—rather a strange event on which to hinge a celebration of any kind—appears to have been a great success. It attracted a large concourse of visitors, for whose delectation several excavations were made, and innumerable objects of great interest brought to light. One house excavated seems to have been a bird-seller's shop, judging from the small bones found, the little drinking vessels, and the quantities of millet and hemp seed, and what looked like small beans. The memorable feature of the commemoration, however, is the volume issued by the Director of the Museums of Naples. The eminent astronomer, Prof. Palmieri, contributes a paper on Vesuvius in the times of Strabo and Spartacus, and on the changes it underwent A. D. 79. Ruggiero discourses effectively on the eruption.

An Invention Wanted. $5,000 to be Offered for It.

THE American Humane Association, the Secretary of which is Mr. Abram Firth, of Boston, Mass., at its recent meeting in Chicago, adopted the following resolutions, which were introduced by Mr. Firth.

"*Whereas*, An urgent need exists of an improved cattle car in which animals can lie down and rest, and in which they can be watered and fed while on their journey to the markets, and be saved the suffering attendant upon loading and unloading from the cars, and at a serious loss of time to all having a pecuniary interest in the business; and

"*Whereas*, Objections are urged by the railroad companies against existing cars made to attain the ends named; and

"*Whereas*, We strongly believe that invention may be stimulated in this direction; be it

"*Voted*, That this Association, recognizing its great importance, would urge all persons interested in its work to pledge themselves to pay a definite sum towards a prize for this object.

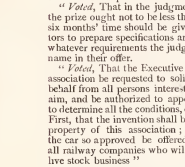
"*Voted*, That in the judgment of this meeting the prize ought not to be less than $5,000, and that six months' time should be given to all competitors to prepare specifications and models, and meet whatever requirements the judges of the prize shall name in their offer.

"*Voted*, That the Executive Committee of this association be requested to solicit pledges in this behalf from all persons interested in this specific aim, and be authorized to appoint the judges and to determine all the conditions, excepting only two: First, that the invention shall be the unembarrassed property of this association; and, secondly, that the car so approved be offered without charge to all railway companies who will use it in all their live stock business."

The Proportional Velocities of Belt-Driven Pulleys.

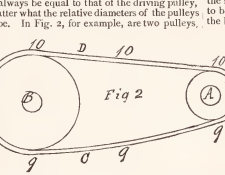
BY JOSHUA ROSE, M.E.

WHEN a belt is stretched upon two pulleys and remains at rest there will be an equal tension on all parts of the belt (that is to say, independent of its weight, which would cause increased tension as the points of support on the pulleys are approached from the centre of the belt between the two pulley shafts); but so soon as motion begins and power is transmitted this equality ceases, for the following reasons: In the accompanying illustration, Fig. 1, A



is the driving and B the driven pulley, rotating as denoted by the arrows; hence C is the driving and D the slack side of the belt; now let us examine how this slackness is induced. It is obvious that pulley A rotates pulley B through the medium of the side C only of the belt, and from the resistance offered by the load on B the belt stretches on the side C. The elongation of the belt due to this stretch, pulley A takes up and transfers to side D, relieving it of tension and inducing its slackness. The belt therefore meets pulley B at the point of first contact, E, slack and unstretched, and leaves it at F under the maximum of tension due to driving B. While, therefore, a point in the belt is traveling from E to F, it passes from a state of minimum to one of maximum tension. This tension proceeds by a regular increment, whose amount at any given point upon B is governed by the distance of that point from E. The increase of tension is, of course, accompanied by a corresponding degree of belt stretch, and therefore of belt length; and as a result, the velocity of that part of the belt on pulley B is greater than the velocity of any part on the slack side of the belt; hence the velocity of the pulley is also greater than that of the slack side of the belt. In the case of pulley A the belt meets it at G under a maximum of tension, and therefore of stretch, but leaves it at H under a minimum of tension and stretch, so that while passing from G to H the belt contracts, creeping or slipping back on the pulley, and therefore effecting a reduction of belt velocity below that of the pulley. To summarize, then, the velocity of the part of the belt enveloping A is less than that of A to the amount of the creep; hence the velocity of the slack side of the belt is that of A, minus the belt creep on A. The velocity of the part of the belt on B is equal to that of the slack side of the belt, plus the stretch of the belt while passing over B; and it follows that if the belt or slip creep on one pulley is equal in amount to the belt stretch on the other, the velocities of the two pulleys will be equal.

Now (supposing the elasticity of the belt to remain constant, so that no permanent stretch takes place) it is obvious that the belt-shortening which accompanies its release from tension can only equal the amount of elongation which occurs from the tension; hence, no matter what the size of the pulleys, the creep is always equal in amount to the stretch, and the velocity ratio of the driven pulley will (after the increase of belt length due to the stretch is once transferred to the slack side of the belt) always be equal to that of the driving pulley, no matter what the relative diameters of the pulleys may be. In Fig. 2, for example, are two pulleys,

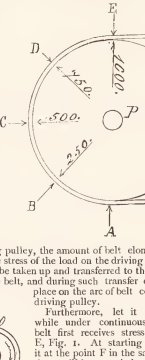


A and B, the circumference of A being 10 inches, while that of B is 20; and suppose that the stretch of the belt is an inch in a revolution of A (B being the driving pulley). Suppose the revolutions of A to be 1 per minute, then the velocity of the belt where it envelops A and B, and on the sides C and D, will be as respectively marked.

Thus the creep being an inch per revolution of A, the belt velocity on the side C will be nine inches per minute, and its stretch on B being an inch, the velocity of B will be 10 inches per minute, which is equal to the velocity of the driving pulley.

It is to be observed, however, that since A receives its motion independent of the belt, its motion is independent of the creep, which affects the belt velocity only; but in the case of B, which receives its motion from the belt, it remains to be seen if stretch is uniform in amount from the moment it meets this pulley until it leaves it, for unless this be the case, the belt will be moving faster than the pulley at some part of the arc of contact.

Thus suppose P, Fig. 3, represents a driven pulley, whose load is 1,000 lbs., and that from A to B, from B to C, from C to D, and from D to E, represent equal arcs of contact between belt and pulley; then arc A B will have on it the amount of stretch due to a pull of 250 lbs. at B, diminishing to nothing at A. Arc C B will have on it the amount of stretch due to a pull of 500 lbs. at C and 250 at B; arc D C will have on it the amount of stretch due to a load of 750 at D, and 500 at C; and arc D E will have the tension due to a load of 1,000 lbs. at E, and 1,000 lbs. at F, and 750 lbs. at D. Suppose, then, that the amount of belt stretch is greater between B C than it is between D E, then the belt will travel faster between B C than between D E to an amount equal to the difference in stretch, and will at B C slip over the pulley to that amount; or if the friction of the belt at B C is sufficient to move the pulley in accordance with the stretch, then the belt must move the pulley at a greater velocity than the belt motion from D to E.



But since the friction of the belt is greatest at D E, it will hold the pulley with the greatest force, and hence the velocity of the belt and pulley will be uniform, or at least the most uniform, at D E.

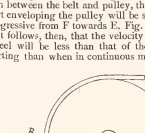
Here arises another consideration, in that the stretch of the leather is not uniform, and the section of belt at C B may stretch more or less under its load than section C D does under its load, in which event the velocities of the respective belt sections cannot be uniform, and to whatever amount belt slip ensues the velocity of the driven wheel will be less than that of the driver.

Attention has thus far been directed to the relative velocities of the pulleys while under continuous motion. But let us now examine the relative velocities when the two pulleys are first put in motion. Suppose, then, the belt and pulley to be at rest with an equal degree of tension (independent of the weight of the belt as before) on both sides of the belt. On motion being imparted to the driving pulley, the amount of belt elongation due to the stress of the load on the driving pulley has first to be taken up and transferred to the slack side of the belt, and during such transfer creep is taking place on the arc of belt contact on the driving pulley.

Furthermore, let it be noted that while under continuous motion, the belt first receives stress at the point E, Fig. 1. At starting it first receives it at the point F in the same Fig., and there will be a period of time during which the belt stretch will proceed from F towards E, the pulley remaining motionless. The length of duration of this period will, in a belt of a given width and having a given arc of contact on the driven pulley, depend on the amount of the load. Thus referring to Fig. 4, if the amount of the load is such that the arc of contact between the points A and B is sufficient to drive the pulley the pulley will receive motion when the belt stretch has proceeded from A to B; but if the load on the pulley be increased the belt stretch will require to proceed farther towards C.

At the point A the stretch will proceed simultaneous with that of the driving side of the belt, between the points F and G, Fig. 1; but from the friction between the belt and pulley, the stretch of the part enveloping the pulley will be subsequent and progressive from F towards E. Fig. 1.

It follows, then, that the velocity of the driven wheel will be less than that of the driver at first starting than when in continuous motion.

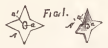


As the length of the belt is increased, the gross amount of stretch, under any given condition, increases, and hence the longer the belt, the greater the variation of velocity at first starting, between the driven pulley and the driver.

From what has been said, it follows that when a mathematical equal velocity ratio is essential, belts cannot be employed, but the elasticity that disturbs the velocity ratio possesses the quality of acting as a cushion, modifying on one pulley any shocks, sudden strains or jars existing on the other, while the longer the belt and less strained within the limit of elasticity, the greater this power of modification; furthermore, in case of a sudden or violent increase of load, the belt will slide on the pulley, and in most cases slip off it, thus preventing the breakage of parts of the driving gear or of the machine driven that would otherwise probably ensue. Furthermore, belt connections are light er and cheaper than gear wheel or other rigid and positive connections, and hence the wide application of leather belts for the transmission of power, notwithstanding the slight variations of pulley velocity ratio due to the unequal elasticity of the various parts of the leather composing the belt.

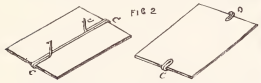
Recently Patented Inventions.

AN improvement in barbs for wire fences is shown in Fig. 1, the invention of Mr. James H. Weaver, of Chicago, Ill. The barb A is made of thin flexible sheet metal, with radial projections, giving it a star shape. A hole, *a*, in



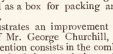
the centre, and a slit, *a'*, cut through the side of the piece into the central hole, permit the barb to be bent as shown at the right of the figure, for attachment to the wire, and after it is placed on the wire it is flattened into the form shown at the left.

A neat device is the pin ticket or tag shown in Fig. 2, invented by Mr. Edward A. G. Roulstone, of Boston, Mass. A wire is made to clasp the ticket



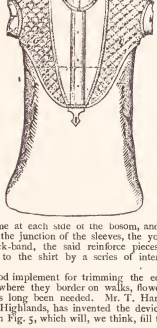
at the ends, as shown, and being recurved, has its ends pointed, by which means the ticket is readily attached.

A package for the sale of spices, etc., is the invention of Robert S. West, of Cleveland, O. It has a top-piece provided with a cake-cutter on the under side, the bottom section of the cylindrical



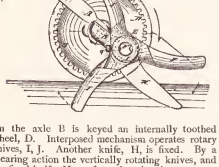
portion having a vent-hole for a biscuit-cutter and the middle cylinder for a muffin ring. The whole may be used as a box for packing articles of the kind named.

Fig. 4 illustrates an improvement in shirts, the invention of Mr. George Churchill, of Troy, N. Y. The invention consists in the combination with a shirt-front of reinforce pad-pieces, C, secured to



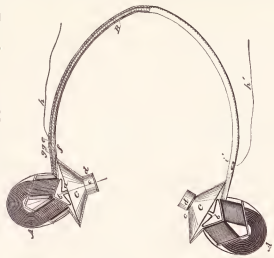
the same at each side of the bosom, and to the shirt at the junction of the sleeves, the yoke and the neck-band, the said reinforce pieces being quilted to the shirt by a series of intersecting stitches.

A good implement for trimming the edges of lawns where they border on walks, flower-beds, etc., has long been needed. Mr. T. Hanley, of Boston Highlands, has invented the device illustrated in Fig. 5, which will, we think, fill the bill,



On the axle B is keyed an internally toothed wheel, D. Interposed mechanism operates rotary knives, I, J. Another knife, H, is fixed. By a shearing action the vertically rotating knives, and the fixed knife, H, perform the trimming.

An improvement in telephones, shown in Fig. 6, is the invention of Andrew G. Hubbard, of Dan-



bury, Conn. Besides some peculiarities of construction of the magnets, it is adapted to be placed over the head in connection with the ears. Thus both ears are enabled to hear the message. The receivers, A, are connected to each other by an elastic hoop, B, covered with silk and provided with ears, *c*, *c'*, for the attachment of the circuit wires, *h*, *h*. The helix wire, *f*, is coiled around this hoop as shown, and is insulated by two folds of silk, *g*, *g*. The magnets A are formed of thin pieces of steel bent into horse-shoe form, which brings their poles opposite to the armatures and diaphragms, and the diaphragms are provided with ear-pieces, P.

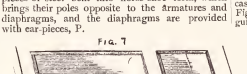


Fig. 7 shows an improvement in door-braces invented by Joseph Louprette, Glens Falls, N. Y. A metal strap is secured to the edge of the door by screws, to stiffen the door and prevent its warping.

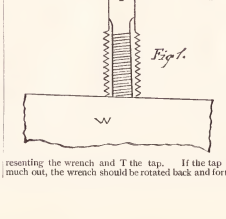
AN attempt is being made to substitute paper for wood in Germany in the manufacture of lead pencils. It is steeped in an adhesive liquid, and rolled round the core of lead to the required thickness. After drying it is colored, and resembles an ordinary cedar pencil. The pencils sell to retailers at about 65 cents a gross.

Shop and House Hints.

Size for Gilding.—S. K. asks for a recipe for this purpose. As there is quite a variety of sizes for various kinds of gilding, he must make his query a little more definite, stating the material he wishes to gild, whether the gilding is to be burnished, etc., etc.

Kerosene Oil Furnace.—A. D. C. also wishes directions for making a furnace to use kerosene oil, for soldering copper, melting glue, Babbit metal, etc., etc. Perhaps some of our readers can supply him with this information; but we should think some one of the numerous oil stoves in the market would answer, and cost less than he could make one for.

Use of Taps. Taps that are cutting out of straight may be righted by exerting a downward pressure on the high side of the wrench as at A, in Fig. 1; B rep-



resenting the wrench and T the tap. If the tap is much out, the wrench should be rotated back and forth through a half revolution, the downward pressure being relieved on the back stroke. To test the tap for

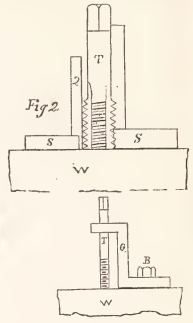


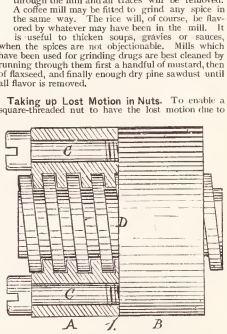
FIG. 3.

straightness, apply a square as to Fig. 2, in which S, S, are two squares, one placed coincident with the thread and the other with the shank of the tap, the latter being the necessary position for taper taps.

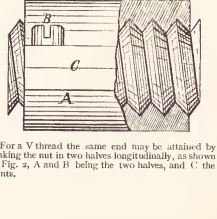
If the holes to be tapped are equi-distant, as in the case of cylinder covers, etc., a guide may be used, as in Fig. 3, in which W is the work, B a bolt securing the guide to the work, G the guide and T the tap.

To Clean Hand Mills.—If it be desired to grind different spices, orange or lemon peel, in the same mill, without any one being affected by another spice, grind a small quantity of rice through the mill and all traces will be removed. A coffee mill may be fitted to grind any spice in the same way. The rice will, of course, be flavored by whatever may have been in the mill. It is useful to thicken soups, gravies or sauces, when the spices are not objectionable. Mills which have been used for grinding drugs are best cleaned by running through them first a handful of mustard, then of flaxseed, and finally enough dry pine sawdust until all flavor is removed.

Taking up Lost Motion in Nuts. To enable a square-threaded nut to have the lost motion due to



wear taken up, it may be made in two halves, A and B in (Fig. 1,) bolted together by the bolts, C. By filing away the face D, the lost motion may then be taken up.



For a V thread the same end may be attained by making the nut in two halves longitudinally, as shown in Fig. 2, A and B being the two halves, and C the joints.

Square Threads. A square thread should have its end cut square as shown in the figure at A. The end will then clean the dirt out of the nut instead of wedging it in.

Eccentric Straps. Eccentric straps and work of a similar form, though bored true in the lathe, are almost always found to be oval when taken apart, the diameter at A, in Fig. 1, being less than that at C; hence they bind the eccentric, as shown in Fig. 2. To obviate

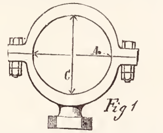
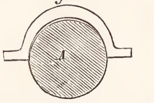


Fig 1

Fig. 2.



this, a piece of sheet metal is placed in the joint of the two straps, and the eccentric bored too large to the amount of the thickness of this piece of metal, which is usually a piece of sheet tin.

Repairing Rubber Valves. B. W. C. W. inquires whether there is any known way of repairing flat rubber valves when the hole in the centre for the steady pin becomes worn. We have sought information upon this point from the New York Belting and Packing Co., and find that such valves cannot be repaired. They may be sold as old rubber at a price ranging from three to four cents per pound.

Chasers for Cutting Screws.—A. D. C. is referred to No. 1, current volume, Shop and House Hints, and to No. 8, same volume, article "Chasers," for very full and complete information on this subject.

Cutting-Off Tools. Cutting-off tools for wrought iron will cut much better if hollowed out in front, as shown at C, in Fig. 1, but for brass should be ground off as at D, Fig. 2, which will greatly improve them.

List of Patents Granted October 21st and October 28th, 1879.

We will supply copies of any of the patents in this list, post-paid, to any address in the United States or Canada, on receipt of 50 cents per copy.

Patents Granted October 21st, 1879.

Aerator and refrigerator for beer and other liquids, C. P. Blatt ... 220,795
Agate and other stones, bleaching, coloring and ornamenting, A. Dreher ... 220,708
Aluminous cake, manufacture of, F. Laur ... 220,720
Anvil and vise, combined, G. B. St. John ... 220,886
Axle-box, car, T. A. Bissell (reissue) ... 8,940
Bale-tie, W. H. Roane ... 220,869
Baling-press, J. W. Cagle and J. W. Nichols ... 220,802
Baling-press, W. L. Morris ... 220,859
Bee-hive, D. P. Bower ... 220,747
Beer, apparatus for filling out, J. and J. Stuber ... 220,888
Beer, extracting malt in the manufacture of, J. A. Schaefer ... 220,872
Blasting squib, T. S. Thomas and J. R. Powell ... 220,735
Boat-lowering apparatus, H. Bruns ... 220,798
Boot and shoe button-hole, B. L. Newhall ... 220,860
Boot and shoe forming machine, J. H. Walker and J. McIntyre ... 220,775
Boot and shoe sole edges, machinery for finishing, E. Humphrey ... 220,841
Boot, rubber, G. Watkinson ... 220,778
Bootee, J. F. Emerson ... 220,710
Bracket, J. J. Read ... 220,730
Bung and bushing, J. A. Rutschman ... 220,871
Bung and stopper for casks, W. H. Stewart ... 220,773
Button, dress, R. E. Brookes ... 220,697
Can cover, J. H. Hettinger ... 220,835
Candlestick, A. J. Smith ... 220,879
Car-coupling, G. Bradley and A. H. Sherratt ... 220,797
Car-coupling, J. T. Cook and J. S. Leas ... 220,899
Car-coupling, F. C. Doolittle ... 220,814
Car-coupling, S. Garratt ... 220,713
Car-coupling, G. C. Harlin and F. N. Byram ... 220,830
Car-coupling, J. H. Horton ... 220,716
Car-coupling, P. Y. Kepler ... 220,719
Car-warmer, street, I. S. Justh ... 220,718
Car window, W. J. Hall ... 220,756
Carbureter, J. H. Bean ... 220,695
Carding machine, T. Kershaw ... 220,905
Carriage springs, machine for forming the eyes of, J. Evans ... 220,711
Carriages, reversible handle for children's, F. Meinecke ... 220,721
Cartridge capping and uncapping implement, G. L. Bailey ... 220,743
Cartridge turning implement, G. G. Rawbone ... 220,771
Catarrh remedy, H. E. Bissell ... 220,794
Centrifugal machine, J. Gaunt and W. F. Poiesz ... 220,824
Churn, S. Collins ... 220,750
Clay or cement to make the joints of stoves and fire-places, fire, J. Hinklein ... 220,715
Clock and watch, J. A. Miller ... 220,724
Clothes-line reel, P. E. Bird ... 220,793
Clothes-wringer, G. S. Foos ... 220,821
Coffee and rice huller, C. B. Brown ... 220,698
Coffee-pot, J. D. Adney ... 220,691
Coin-holder, L. H. Olmsted ... 220,770
Collar and hame attachment, A. Carlin ... 220,804
Concrete pipe, apparatus for making and laying continuous, E. M. Hamilton and C. N. Earl ... 220,757
Copper-lined boiler, W. L. Brownell ... 220,748
Corn-stub cutter and splitter, S. Sherman ... 220,877
Corset, abdominal, J. C. Cook ... 220,806
Cotton-gin, J. F. Means ... 220,854
Cotton-gin, F. E. Smith ... 220,880
Cotton-scraper, L. W. Carraway ... 220,700
Cradle, platform, F. Mohr ... 220,857
Cupel-furnace, S. G. Wight ... 220,895
Curtain-fixture, J. W. Core ... 220,807
Curtain-roller and bracket, T. Barrett and G. Knapp ... 220,787
Curtain-roller, spring, T. Barrett ... 220,786
Dental engine, J. Heron ... 220,834
Door-brace, J. Louprette ... 220,852
Dredge-winder, C. C. Green ... 220,827
Electric recorder, P. A. Dowd ... 220,752
Elevator, P. Hinkle ... 220,758
Elevators, governor and safety appliance for, G. Dryden ... 220,709
Eye-glasses, nose-clamp for, F. Perrin ... 220,864
Fence, barbed wire, J. H. Weaver ... 220,740
Fence, rail, B. A. Welds ... 220,892
Fence, wire, L. W. Bosart ... 220,746
Fire-alarm telegraph box, non-interfering, A. W. Gray ... 220,754
Fire-arm lock, A. E. Barthel ... 220,785
Fire-arm, magazine, J. J. Sweeney and W. W. Wetmore ... 220,734
Fire-escape, O. H. Curtis ... 220,703
Fire-extinguisher, automatic, E. Leonard ... 220,764
Fire-place, open, E. A. Jackson ... 220,843
Fishing-reel, S. W. Wardwell, Jr ... 220,776
Furnace-feeder, automatic, R. S. Dillon and W. Scully ... 220,901
Fuse for shells, time and distance, H. Berdan ... 220,792
Garter, W. W. Anderson ... 220,692
Gas-burner, O. Tirrill ... 220,736
Gas-lighting device, electric, W. C. Cutler ... 220,704
Gilder's press, J. T. Shepperd ... 220,875
Glassware, manufacture of, H. Franz ... 220,822
Governor and speed regulator, engine, J. Reid ... 220,867
Governor, steam-engine, A. Lawrence (reissue) ... 8,937
Grain-meter, J. Nurnberger ... 220,861
Grater and cutter, vegetable, W. Mild ... 220,723
Grave-shield and body-protector, S. S. Smick (reissue) ... 8,941
Harness-pad, adjustable, J. Johnson ... 220,846
Harvester-pitman, D. S. Blue ... 220,696
Hat-finishing machine, J. Surerus ... 220,774
Hat-pouncing machine, E. B. Taylor ... 220,889
Hat-sweat, H. O. Baker and H. Van Gelder ... 220,744
Hitching device, safety, J. A. Fife ... 220,820
Horse-litter, C. V. Petteys ... 220,865
Ink-well, J. D. Williams ... 220,742
Ironing machine, J. Reidy ... 220,868
Kitchen boiler, L. S. White ... 220,782
Kneader, dough, O. W. Robins ... 220,731
Lamp, H. H. Barnard and G. V. Hanna ... 220,788
Lamp, E. S. Drake ... 220,706
Lamp, E. S. Drake ... 220,707
Lamp, J. P. Smithers ... 220,881
Lamp, C. F. Spencer ... 220,884
Lamp-burner, G. K. Osborn ... 220,725
Lamp, electric, D. Pendleton ... 220,728
Lard-cooler, P. Cudahy ... 220,811
Lead pigments, making, G. T. Lewis and E. O. Bartlett (reissue) ... 8,943
Letter and character, mica, F. Holthausen ... 220,903
Letters, making partly transparent, F. Holthausen ... 220,904
Lifting-jack, A. N. Woodard ... 220,897
Malt extract, producing, G. A. Gessner ... 220,825
Mangle, C. Reese ... 220,866
Match, friction, W. T. Mersereau ... 220,722
Measure, scale, J. M. Gaskins ... 220,823
Metal trap, soft, J. McCloskey ... 220,767
Mining-drill, F. B. Parrish ... 220,863
Mirror, folding, N. F. McEvoy ... 220,853
Mitre-box, D. C. Rogers and A. D. Goodell ... 220,732
Mower, F. Bramer ... 220,796
Mower, W. F. Rundell ... 220,870
Mower, lawn-edge, T. Hanley ... 220,829
Ore-separator or concentrator, W. L. Imlay ... 220,842
Organs, pneumatic action for, J. E. Treat ... 220,737
Oven, baker's, E. B. Cassidy ... 220,898
Ox-shoe-blank bar, J. Deeble ... 220,813
Packing, piston, C. W. Baldwin ... 220,784
Pantaloons and other garments, E. Spies ... 220,885
Paper-bag machine, W. C. Cross ... 220,810
Paper-cutting machine, lever, E. L. Miller ... 220,856
Paper-folding machine, W. Scott ... 220,873
Paper stock, reducing wood to, W. N. Cornell and C. Tollner ... 220,808
Pavement, wood, W. H. Stow ... 220,887
Paving block, J. C. Anderson and J. Greenawalt ... 220,693
Pea-sheller, J. and S. W. Budd ... 220,800
Pen, perforating, M. E. Baird and J. W. Macy ... 220,783
Pepsin, preparation of, W. H. Ball ... 220,745
Photographic embossing press, N. Weston ... 220,780
Pitman connection, S. Shiflett ... 220,878
Plaiting machine, C. T. Laur ... 220,850
Plated ware, tool for ornamenting, H. W. Hirschfeld ... 220,759
Plow, riding, A. Belchambers ... 220,790
Plow, sulky, P. L. Case ... 220,701
Pocket knife, C. L. Butler ... 220,699
Printing machine, chromatic, G. W. Woodside (reissue) ... 8,939
Pump, J. and R. Bean ... 220,789
Pump, D. C. Montgomery ... 220,858
Pump, hydraulic air, G. K. Osborn ... 220,726
Pumps, safety device for steam, N. W. Dunlap ... 220,753
Rocking chair, J. Loch ... 220,851
Rolling iron, W. D. Eynon and W. Lloyd ... 220,818
Rolling-pin, P. Cromer ... 220,702
Root-cutting machine, J. W. Weymouth ... 220,894
Sash-fastener, J. L. Wayne, Jr ... 220,891
Sash stop and lock, H. A. Crosby and M. W. Thompson ... 220,809
Saw clamp, M. J. Barrow ... 220,694
Saw, scroll, C. A. Dearborn ... 220,705
Scraper, walking, G. J. Weber ... 220,741
Seed drill, R. B. Sheldon (reissue) ... 8,938
Seed package, C. O. Wolferts ... 220,896
Sewing machine, hand-power attachment for, A. B. Felt ... 220,819
Sewing machine needle-guard, A. Wemple ... 220,779
Sewing machine shuttle, W. T. Elliott ... 220,816
Sheet-metal coating apparatus, E. Morewood ... 220,769
Shirt, G. Churchill ... 220,805
Shovel, C. W. Hubbard ... 220,760
Signal-box, non-interfering, A. W. Gray ... 220,755
Skiving machine, C. E. Langmaid ... 220,847
Slate, hinged, R. S. Barnum (reissue) ... 8,936
Smoke and cinder conveyer, A. Heine ... 220,832
Snow-plow, J. M. Baldwin (reissue) ... 8,944
Snow-plow, A. Day ... 220,812
Spark-arrester, S. Byram and W. R. Hansford ... 220,801
Speculum and electric light, S. Huffman ... 220,762
Spice-package and pastry-utensil, combined, R. S. West ... 220,781
Spinning rope-yarn, &c., machine for, O. Shechan ... 220,876
Steam generator, J. Everding ... 220,712
Steam or water engine, A. G. Waterhouse ... 220,777
Steamer, feed, H. S. Groves ... 220,828
Stove door, illuminated, J. Jewett ... 220,845
Stove, gas, C. Hoffmann ... 220,838
Stove, oil, J. A. Frey ... 220,902
Strap-protector and buckle, T. Padgitt ... 220,862
Stud for boots and shoes, G. H. Ellis ... 220,817
Stump-extractor, R. A. Courtney and L. J. Foster ... 220,900
Telegraph and fire-alarm signal apparatus, A. C. and A. H. Palmer ... 220,727
Telegraph, underground, C. Linford ... 220,765
Telephone, A. C. Hubbard ... 220,839
Telephone-case, G. M. Phelps ... 220,729
Telephone-circuit, A. G. Bell ... 220,791
Telephone, electric speaking, F. P. Mills ... 220,855
Telephone exchange system and device, F. Shaw ... 220,874
Telephone signal, F. A. Gower ... 220,826
Telephone switch, H. A. House ... 220,717
Ticket or tag, pin, E. A. G. Roulstone ... 220,772
Tile, drain, A. Campbell ... 220,749
Time-keepers, escapement for, J. J. Johnston ... 220,763
Time-pieces, escapement for, A. G. Laughlin ... 220,849
Tin and terne plate, manufacture of, E. Morewood ... 220,768
Tobacco, machine for dressing and finishing fine-cut, T. R. Spence ... 220,883
Trace-carrier, J. D. Hobbs ... 220,837
Trace-carrier, G. M. Hubbard ... 220,761
Treadle, E. T. Thomas ... 220,890
Trees, roots, &c., compound for destroying, W. T. Buchanan ... 220,799
Turbine wheel, D. Hubbard ... 220,840
Tuyere, T. McCaffery ... 220,766
Vegetable slicer and grater, combined, A. Smith ... 220,882
Washing machine, J. Carroll ... 220,803
Washing machine, M. L. Hawks ... 220,714
Washing machine, A. Walton ... 220,738
Washing machine, D. Warnock ... 220,739
Watches, removable potance for, F. A. Earl ... 220,815
Water elevator, A. C. Jackman ... 220,844
Water-wheel, J. Todd (reissue) ... 8,942
Watering stock, device for, W. T. Landreth and R. Garnett ... 220,848
Weather strip, M. Herrens ... 220,833
Whiffletree-hook, Z. M. Hibbard ... 220,836
Windmill, Z. and F. M. Cottle ... 220,751
Wood-work, mosaic, C. H. Westcott ... 220,893
Wool-washing machine, F. G. Sargent ... 220,733
Zinc furnace, E. C. Hegeler and F. W. Matthiessens ... 220,831

Patents Granted October 28th, 1879.

Addressing attachment for printing-machines, J. M. Kennard ... 220,977
Air-compressing apparatus, J. Treat ... 221,126
Amalgamator, A. T. Ladd ... 220,978
Anchor, power, E. S. Webster ... 221,131
Asphaltum pipe, T. H. Walsh ... 221,130
Axle box, car, E. Robinson and J. W. Rusk ... 220,990
Axle-box lid, railway, F. C. L. G. Susemihl and H. H. Hewitt (reissue) ... 8,947
Bale-tie, R. H. Goldsmith ... 221,051
Bark-mill, C. P. Ryther ... 220,945
Barrel-branding machine, C. G. Singer ... 220,957
Barrel-holding clamp, A. Shedlock ... 220,995
Bed-spring, W. S. Gray ... 221,054
Beer-cooler, E. M. Tilley ... 221,005
Bell, door, P. Shellenback and W. E. Drayer ... 221,110
Book-mark, W. J. Lynch ... 220,927
Bottle-stopper, S. S. Newton ... 221,091
Bottle-stopper, D. E. Stevens ... 221,001
Bran-cleaner, T. Wallace ... 220,951
Brick-drying car, W. L. Gregg ... 220,972
Brush, J. J. C. Smith ... 220,947
Brush, Wooden, B. F. Carpenter and G. W. Lee ... 221,032
Buckle, D. J. Jeffery ... 221,071
Buckle, G. W. McGill ... 220,935
Building, fire-proof, J. J. Schillinger ... 221,107
Bushes in holes, tools for securing, C. G. Singer ... 220,996
Buttons, &c., machine for polishing, T. L. Calkins and F. O. Badger ... 221,030
Cabinet, provisions, W. Nelson ... 221,090
Car-spring, A. B. Davis ... 221,036
Car-step, M. E. Skerritt ... 221,111
Carriage-shackles, machine for forming, S. M. Rowell ... 221,102
Carriage-top, M. M. Cady ... 220,960
Cartridge capping and uncapping implement, A. D. Laws ... 220,979
Celluloid, &c., manufacturing, polishing and seasoning sheets of, J. W. Hyatt ... 221,070
Chains, &c., elastic link for, J. D. Luallen and T. Pairan ... 220,926
Check-hook, W. Wellington ... 221,007
Chimney top and ventilator, G. E. Barker ... 221,019
Churn-dasher, J. E. Gibbs ... 221,048
Cigarette-machine, portable, H. Gerike ... 221,046
Clay pipe, tile, flue-lining, &c., N. U. Walker ... 221,127
Clevis, plow, J. F. Mitchel ... 220,938
Clutch, friction, R. W. Whitney ... 221,009
Clutch, safety, G. W. Baker ... 220,955
Collar and cuff, T. N. Page ... 220,941
Collar-support and friction-pad, J. E. Crane ... 220,963

Coloring-matter derived from toluol, J. H. Stebbins, Jr.	221,120
Coloring-matter obtained from cresol, J. H. Stebbins Jr	221,117
Coloring matter obtained from diamide-napthaline and diazo-napthaline nitrate, J. H. Stebbins, Jr.	221,116
Coloring-matter obtained from napthylamine and diazo-benzole nitrate, J. H. Stebbins, Jr	221,119
Coloring-matter obtained from salicylic acid, J. H. Stebbins, Jr	221,118
Colors from diazo-benzole nitrate and pyrogallol, J. H. Stebbins, Jr	221,114
Colors from picric acid, J. H. Stebbins, Jr	221,115
Corset-clasp, L. F. McNett (reissue)	8,948
Cotton-chopper, W. W. Sauls	221,106
Cultivator, G. Hammans	221,058
Cultivator, A. and C. A. Norling	220,985
Curry-comb, P. Plant	220,986
Curtain-fixture, spring, S. S. Putnam	220,987
Cutter-head, rotary, M. V. Bavis	221,020
Damper and ventilator, smoke-pipe, E. Lambur	221,075
Distilling petroleum, apparatus for, J. Cole, Jr	220,962
Egg-beater, G. H. Backmire	221,016
Electric-conductor, A. A. Knudson	221,074
Electrical conductor, L. H. Rogers	220,943
Electrical conductor, E Wheeler	221,133
Electrical conductors, manufacture of, L. H. Rogers and W. A Shaw	220,944
Electrical envelope for safes, vaults, &c., E Holmes and H. C. Roome (reissue)	8,949
Electrical envelope for safes, vaults, &c., E. Holmes and H. C. Roome (reissue)	8,950
Electricity, process and apparatus for the storage of, E. Thomson and E. J. Houston	220,948
Elevator, R. B. Dawson	221,037
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Fence-post, R. C. Ramsey	220,988
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Folding chair, J. E. Wakefield	220,949
Fruit-drier, G. S. Grier	221,056
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Grain meter, A. Lowmiller	221,083
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Stench and other traps, T. G. Knight	221,073
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Telegraph line, underground, T. B. Atterbury	220,954
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Telegraph pole, D. Lathrop	22 ,976
Telephone, acoustic, H. Willard and A. M. Cheney	221.135
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Washing machine, J. Sharp and J. S. Brandt	220,994
Washing machine, J. W. Smith	221,112
Watch-key, stem-winding, E. C. Fitch	220,916
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Watering stock, device for, J. S Campbell	221,031
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Windmill, R. Lorenzo	221,081
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Wire, manufacture of glass-coated, P. Arbogast	220,908
Wire, &c., with glass, coating, P. Arbogast	220,907
Wool-press, A. Lowmiller	220,980
Woven fabrics, machine for pressing and finishing, E. Gessner	221,047

Industrial Wants.

Under this heading we will publish, as may be demanded, without charge, any request for information about machinery or other appliances desired by any of our readers, or needed in their business or household economy, giving the full name and address of the person who makes the inquiry, that other readers who have the article inquired for on sale, or know where it may be obtained, may communicate directly with the inquirer. It is obvious that we cannot gratuitously publish answers to such inquiries, they being in the nature of advertisements; but if any manufacturer wishes to publish answers in order to reach others beside the one specially seeking the information, he can do so in our column of "Business Hints" at 50 cents per line.

ICE MACHINE.

Mr. W. J. David, of Robious, Chesterfield Co., Va., wishes an ice machine, suitable for family use, to take with him to Africa.

BURNING PETROLEUM.

Mr. S. R. Fairchild, of Diamond Springs, El Dorado Co., Cal., wants an appliance for burning crude petroleum for steaming purposes. He is using a 15 H.-P. engine with a small locomotive boiler, in a sparsely wooded country and out of reach of coal-supply.

PREMIUM LIST.

Scientific News, 1880.

We desire to call the attention of our present subscribers, and others who may be induced to solicit subscriptions for the Scientific News, to the unprecedented list of premiums of money and articles of general utility and value presented herewith. Every article offered is from a First-Class Manufacturer and is guaranteed to be worth in this market the full retail value set against it.

In this enterprise, as in all others, we propose to deal upon strictly honorable and fair principles.

We offer, it will be seen, two classes of premiums, *Competitive* and *General*.

Those who intend to compete for the cash premiums must send us a written notice of such intention.

The class of general premiums is offered for specific numbers of subscribers only; but any one who competes for a cash premium, and fails to get it, may choose from the class of general premiums any article specified as the premium for such a number of subscribers as he may be able to secure, and will be entitled to receive such premium.

In this way, no one forwarding to us any number of subscribers equal to, or exceeding, the smallest number named in this list, will fail to receive a premium.

Remittances may be forwarded by check postal order, or in cash by express, express charges to be prepaid.

The charges for transportation on premiums must also be paid by the recipient.

Address S. H. Wales & Son, Office of the Scientific News, No. 10 Spruce St., New York.

LIST OF PREMIUMS.

CLASS I.

CASH PREMIUMS FOR COMPETITION.

No. 1.—For competition, we offer in cash as a premium for the largest number of subscribers sent in on or before Feb. 1st, 1880, by any single person, **$100**

The subscriptions may be sent from different post-offices and in installments or all at once, as the person competing chooses.

No. 2.—For the second largest list we will give to the person sending the same, on same conditions, **$50**

No. 3. For the third largest list we will give as a premium, on same conditions as above, **$25**

Those receiving these competitive premiums will not be entitled to premiums for the same subscribers from the general premium list which follows; but all those who enter as competitors and fail to obtain either of the competitive premiums, may demand for the number of subscribers they send us a premium corresponding thereto, as above explained.

GENERAL PREMIUMS.

These premiums may be selected, one premium corresponding to the number sent, or two or more premiums the equivalent of the same.

Any one approximating a number of subscribers for which is offered a particular premium, may remit to us in cash 80 per cent. of the money they fall short of reaching the required sum, also the sum required to meet the subscriptions they send us, and they will then be entitled to the premium selected by them.

For instance, suppose some one should wish to secure the $50 Remington Sewing Machine, to receive which he must send us 105 subscribers at one dollar and ten cents each, or $115.50. Should he get no more than eighty subscribers, and should prefer this sewing machine to any other premium to which eighty subscribers would entitle him, he may, by sending in addition to the $88 collected from the eighty subscribers, send us 80 per cent. of the remaining $27.50, which amounts to $22, and he can receive this premium.

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No. 45 will be presented to any one who sends us 44 subscriptions at $1.10 each.

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Business Hints.

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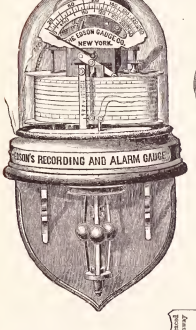

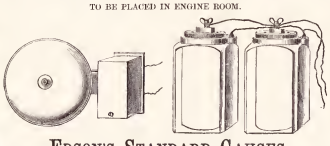

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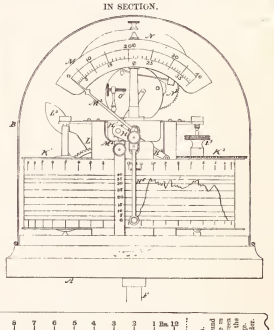

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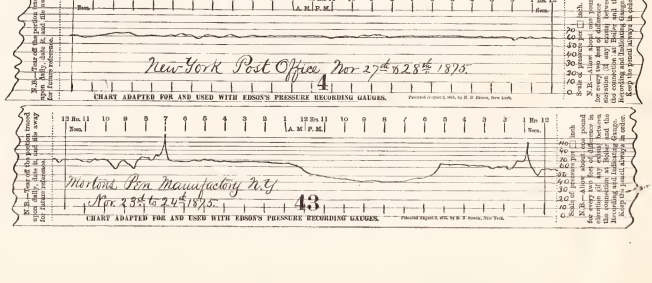

PATENT DEPARTMENT.

In connection with the publication of the SCIENTIFIC NEWS, we make it part of our business to secure patents in the United States, Canada, Great Britain, France, Germany, Belgium, Austria, Russia, Italy and other countries. Caveats filed, Designs patented, Trade-marks and Labels registered, Rejected Cases prosecuted, Re-issues obtained, Interferences managed, Assignments and Licenses prepared.

Careful special searches made at the Patent Office. Inventors who write to us will receive prompt answers to their inquiries. Nothing needful to be done to secure success will be omitted by us in the prosecution of claims entrusted to our care. We shall take cases at prices from $10 to $20 and upwards, depending, of course, upon the amount of labor involved in the preparation of the application. All communications will be regarded as confidential.

INVENTORS who employ us to prepare and prosecute their claims before the Patent Office, can at all times rely upon honorable treatment and careful attention to their case. In fixing our charges we recognize the necessity of the times and make them as low as possible.

Our senior, Mr. Salem H. Wales, in connection with the *Scientific American*, of which he was one of the proprietors and editors for twenty-three years, has had a very extensive experience in connection with Patent affairs, and Mr. Edward H. Wales has been connected with the Patent Office. We understand our business. We prepare our cases with great care, and prosecute them with vigor. " We do not intend to abandon our case before the Patent Office so long as we think our client is entitled to a reasonable and proper claim.

As to our fitness and responsibility for the business, read what the *New York Evening Post* says, Dec. 29, 1876, under the caption "A Good Candidate :" "Mr. Salem H. Wales is mentioned as a possible successor to Mr. Duell as Commissioner of Patents. As editor of the *Scientific American*, he has had more than twenty-three years' experience in connection with patent interests, and his high personal character would be an additional recommendation. It is not known that he would accept the office, but he would make a good officer."

The New York *Sun*, of Oct. 22d, 1875, published in its editorial columns the following : "When Mr. Wales was one of the editors of the *Scientific American*, and was devoting his energies and his mechanical knowledge to the development of the inventive genius of our people, he organized an admirable system for the obtaining of patents, classifying the various invent ons according to the essential principles upon which they were based, and the uses to which it was sought to adapt them."

These testimonials could be multiplied if necessary. We repeat that our cases will be carefully prepared and vigorously prosecuted, and at hard times prices. We will do good work and charge very moderately for it. We shall be glad to receive inventors at our office, or to correspond with them by mail.

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THE SUN FOR 1880.

THE SUN will deal with the events of the year 1880 in its own fashion, now pretty well understood by everybody. From January 1 until December 31 it will be conducted as a newspaper, written in the English language, and printed for the people.

As a newspaper, THE SUN believes in getting all the news of the world promptly, and presenting it in the most intelligible shape—the shape that will enable its readers to keep well abreast of the age with the least unproductive expenditure of time. The greatest interest to the greatest number —that is the law controlling its daily make-up. It now has a circulation very much larger than that of any other American newspaper, and enjoys an income which it is at all times prepared to spend liberally for the benefit of its readers. People of all conditions of life and all ways of thinking buy and read THE SUN ; and they all derive satisfaction of some sort from its columns, for they keep on buying and reading it.

In its comments on men and affairs, THE SUN believes that the only guide of policy should be common sense, inspired by genuine American principles and backed by honesty of purpose. For this reason it is, and will continue to be, absolutely independent of party, class, clique, organization, or interest. It is for all, but of none. It will continue to praise what is good and reprobate what is evil, taking care that its language is to the point and plain, beyond the possibility of being misunderstood. It is uninfluenced by motives that do not appear on the surface ; it has no opinions to sell, save those which may be had by any purchaser for two cents. It hates injustice and rascality even more than it hates unnecessary words. It abhors frauds, pities fools, and deplores nincompoops of every species. It will continue throughout the year 1880 to chastise the first class, instruct the second, and discountenance the third. All honest men, with honest convictions, whether sound or mistaken, are its friends. And THE SUN makes no bones of telling the truth to its friends and about its friends whenever occasion arises for plain speaking.

These are the principles upon which THE SUN will be conducted during the year to come.

The year 1880 will be one in which no patriotic American can afford to close his eyes to public affairs. It is impossible to exaggerate the importance of the political events which it has in store, or the necessity of resolute vigilance on the part of every citizen who desires to preserve the Government that the founders gave us. The debates and acts of Congress, the utterances of the press, the exciting contests of the Republican and Democratic parties, now nearly equal in strength throughout the country, the varying drift of public sentiment, will all bear directly and effectively upon the twenty-fourth Presidential election, to be held in November. Four years ago next November, the will of the nation, as expressed at the polls, was thwarted by an abominable conspiracy, the promoters and beneficiaries of which still hold the offices they stole. Will the crime of 1876 be repeated in 1880? The past decade of years opened with a corrupt, extravagant and insolent Administration intrenched at Washington. THE SUN did something toward dislodging the gang and breaking its power The same men are now intriguing to restore their leader and themselves to places from which they were driven by the indignation of the people. Will they succeed? The coming year will bring the answer to these momentous questions. THE SUN will be on hand to chronicle the facts as they are developed, and to exhibit them clearly and fearlessly in their relations to expediency and right.

Thus, with a habit of philosophical good humor in looking at the minor affairs of life, and in great things a steadfast purpose to maintain the rights of the people and the principles of the Constitution against all aggressors, THE SUN is prepared to write a truthful, instructive, and at the same time entertaining history of 1880.

Our rates of subscription remain unchanged. For the DAILY SUN, a four-page sheet of twenty-eight columns, the price by mail, post paid, is 55 cents a month, or **$6.50** a year ; or, including the Sunday paper, an eight-page sheet of fifty-six columns, the price is 65 cents a month, or **$7.70** a year, postage paid.

The Sunday edition of THE SUN is also furnished separately at **$1.20** a year, postage paid.

The price of the WEEKLY SUN, eight pages, fifty-six columns, is **$1** a year, postage paid. For clubs of ten sending **$10** we willsend an extra copy free.

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(*Continued from page 257.*)

tlemen that we are able to place the facts contained in this article before the readers of the SCIENTIFIC NEWS.

The hands of the workmen in this operation are protected from injury by being incased in bags, which shield them from the heat.

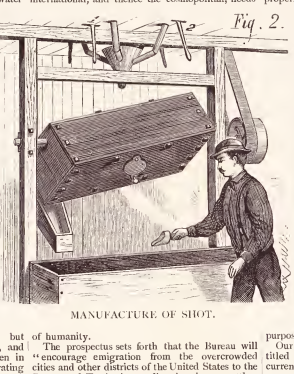
A number of sizes of shot are simultaneously produced from the streams which issue from the perforations. These all fall together into the water below, and are subsequently separated.

The wet shot are lifted from the water which received them by a chain of elevator buckets, and thrown upon an inclined drying table. They roll over this table into a rotating cylinder of wire gauze, in which they are tumbled over and against each other till the minute burrs are worn or broken off. The shot are then conducted by another elevator to a separating table, shown in Fig. 3, designed to cull out the imperfect shot. The round and perfect shot will roll at higher velocity down an incline than the imperfect ones. It is to apply this principle that the table is constructed. It consists of inclines arranged in series, with intervening spaces. In rolling down these inclines the perfect shot acquire sufficient velocity to overleap the interspaces, while the imperfect ones fail to span the chasm; or if any do pass one of the interspaces, they are sure to be intercepted before they pass the entire series. These imperfect shot are again consigned to the melting pots.

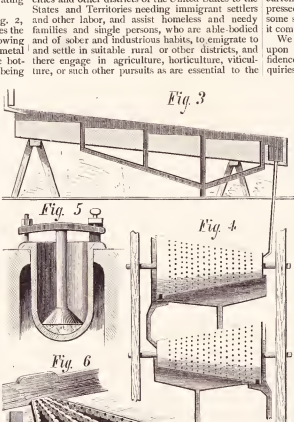
The next operation is the separation of the shot into sizes. This is done by revolving conical screens, Fig. 4, placed one over another in sufficient number. Each retains only a single size of shot. All of smaller size than the screen is designed to retain, pass into a trough which conducts them to another similar screen below, but which retains a smaller size than the first, and passes still smaller sizes on to the next screen in the series, and so on till the sorting or separating is completed.

The shot are then placed in a rumble, Fig. 2, and polished with plumbago, which completes the manufacture. The melting of the arsenic, owing to the rapid oxidation and volatility of this metal when heated, is performed separately in the bottom of a melting pot, as shown in Fig. 5—it being isolated from air by a conical disk held in place by a clamping device as shown.

Buck-shot are not dropped, but cast in moulds. The moulds used are shown in Fig. 6. The cavities which give form to the shot are formed in the sides of a series of bars, which, when placed together, complete the moulds. Some of the bars are fixed and others movable and provided with handles, and are arranged to open and close, the bars being pivoted at the ends, opposite the handles.



MANUFACTURE OF SHOT.



MANUFACTURE OF SHOT.

AN ARCHÆOLOGICAL PUZZLE.—One of the greatest archæological puzzles in our country, says the *American Antiquarian*, is the large-flaked flints, usually called leaf-shaped implements. They are from 4 to 9 inches in length, 3 to 5 wide, and about half-an-inch thick, round at the base and very obtusely pointed at the opposite extremity, the apex being slightly to one side. They show no signs of use whatever, and are found in masses from a few to many hundreds. Mr. Thomas Rhodes, of Akron, O., has lately discovered a *cache* of these objects about three miles west of that town, under an old tamarack stump, about two feet below the surface, in peat or muck. There were 197 in the nest. The largest is 8½ inches long by 3¾ wide; the smallest is about 2½ inches long.

THERMO-ELECTRICITY AND THE ELECTRIC LIGHT.—The workshops of M. Denayrouse, in France, have been experimentally lighted by means of the electric lamp of M. Suisse, worked by a thermo-electric battery constructed by M. Clamond. It is found that more than twice as much charcoal was consumed in heating this apparatus as would have been required to produce the same light by means of a dynamo-electric machine. On the other hand, only about 6 per cent. of the total quantity of heat produced was actually converted into electrical work, the remaining 94 per cent. being readily and conveniently available for heating and ventilating purposes. Moreover, it is considered quite practicable, says the *Electrician*, to economize one-third of the quantity of fuel which was used in the present experiment.

A Great and Worthy Undertaking.

THE COSMO-AMERICAN COLONIZATION AND GENERAL IMPROVEMENT BUREAU, which has its headquarters at 24 Park Place, New York, is worthy of the attention of all people, without regard to nationality, who have seriously at heart the well-being of society and of mankind. The plan is well laid to meet not only the national, but international, and thence the cosmopolitan, needs of humanity.

The prospectus sets forth that the Bureau will "encourage emigration from the overcrowded cities and other districts of the United States to the States and Territories needing immigrant settlers and other labor, and assist homeless and needy families and single persons, who are able-bodied and of sober and industrious habits, to emigrate to and settle in suitable rural or other districts, and there engage in agriculture, horticulture, viticulture, or such other pursuits as are essential to the self-sustenance, comfort and general prosperity of the settlers, individually and socially."

The worthy homeless and needy families will be assigned alternate farm or other lots, the Bureau reserving every alternate or more lots with a view to subsequently selling the same at such enhanced valuation as the surrounding improvements warrant.

"The principle of the scheme is reciprocity. The Bureau will rely wholly upon that righteous usury which insures to all concerned a fair proportion of the benefits. By this means the Bureau proposes to increase the money intrusted to its use as rapidly as possible, in and through the general enrichment of the various colonies of the Bureau. This can be done only in and through the prosperity of the settlers. Their prosperity insures the rapid enhancement of the reserved lots 300 to 600 per cent. and upwards on the cost. This is the natural sequence of such undertakings when properly carried out on commensurate scales.

Hence, the paramount interest of the Bureau is to prosper its settlers. On the same principle that the industry and general improvements of the first alternate settlers thus enhance the real value of the reserved lots, will they, the first settlers, be reciprocally benefited when the second alternate lots shall have been improved."

In the matter of emigration from Europe to America, it is provided that the foreign agents of the Bureau will not send over any emigrants who are not supplied with means for the first year's subsistence, until all who are now in the United States needing homes and assistance shall have been provided for.

The Bureau will not encourage idleness, or in any degree foster pauperism among the able-bodied. It will not give any able-bodied man or woman any money or supplies whatsoever, save upon the conditions of a loan to the receiver, at 6 per cent. annual interest, to be repaid as soon as the borrower is able.

Such an institution is certainly much needed, and ought to be sustained. In and through it the philanthropist can so apply his or her benevolence as to have their subscriptions perpetually serve the purposes for which they are made. Even donations are entitled to dividends, which the donor may direct for further benevolent purposes.

Our readers will recollect that in an article entitled "The Times," published in No. 2, current volume of the SCIENTIFIC NEWS, we expressed the opinion that the time had arrived for some such movement as this. We are glad to see it commenced.

We have taken pains to investigate the grounds upon which this enterprise can claim the confidence of the public, and, after extensive inquiries, feel no hesitation in commending it.

American Glass.

THE Trade in Glass in the United States within the last few years has reached enormous proportions. Pittsburgh, Pa., is the great glass centre of the country. More than half of all the glass produced is made there. The productions aggregate over 7,000,000 dollars annually, employing a capital, which includes buildings, machinery and grounds, of nearly, if not quite, 3,500,000 dollars. There are 79 factories, containing in all 690 pots. Each year 3,000,0000 dollars is paid in wages to the hands employed, who number some 5,248. One can form some little idea of the magnitude of the business by ascertaining the amount of material consumed annually. Last year there were consumed 2,925 tons of German clay, 360 tons of lead, 250 tons of pearl ash, 2,700 barrels of salt, 6, 55 tons of straw, 4,025 cords of wood, 4,525,700 bushels of coal, 703,500 bushels of coke, 1,218 tons of nitrate of soda, 48,340 tons of sand and 150,000 fire bricks. The glass trade since the panic has been in a very unsatisfactory condition. Many small factories have been compelled to discontinue operations, as prices were so reduced that they could not manufacture except at a loss. The present state of trade is more promising, and it now looks as though the glass makers were to receive their share of the advantages of the general revival of industries. There can be no material rise in the price of glass that will not be of inclaculble benefit to Pittsburgh. Its vast factories, that cover over 208 acres of ground, with its colonies of workmen, will be large sharers in any increased values in this staple commodity. As this industry is one of the most prominent among our rapidly growing manufacturing interests, we hope that brighter days are at hand for it, and that there may be a fair enhancement of prices, sufficient to allow a reasonable margin of profit, as this is due to every industry, especially to one at once so beneficial and important as that of the manufacture of glass.—*Chicago Com. Adv.*

A little knowledge is a dangerous thing:
Drink deep or taste not the perennial spring.